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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Before the Board of Patent Appeals and Interferences

In re Patent Application of

HENRICSON et al

Serial No. 08/875,424

Filed: July 28, 1997

For: **METHOD OF PRETREATING PULP TO
BE BLEACHED WITH PEROXIDE**



Atty. Ref.: 30-440

Group: 1731

Examiner: Alvo

#11 Brief

August 23, 1999

Honorable Commissioner of Patents
and Trademarks
Washington, DC 20231

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APPEAL BRIEF

Sir:

Applicant hereby appeals the Final Rejection of March 3, 1999, Paper No. 6.

I. REAL PARTY IN INTEREST

The real party in interest is Ahlstrom Machinery Oy, a corporation of the country of Finland.

II. RELATED APPEALS AND INTERFERENCES

The appellants, the undersigned, and the assignee are not aware of any related appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 16-19, 21, 22, 24-30, and 32-46 are pending and have been rejected.

Claims 1-15, 20, 23 and 31 have been canceled. No claims have been substantively allowed.

IV. STATUS OF AMENDMENTS

No amendments have been filed since the date of the Final Rejection.

V. SUMMARY OF INVENTION

The claimed invention relates to a method of pre-treating, prior to bleaching with peroxide, cellulose pulp, to improve bleachability of the pulp. The invention uses an acid tower 14, 112, and a tower 24 in a second treatment stage. The method comprises the steps of substantially sequentially (see page 4, line 31 through page 5, line 16): (a) If necessary, adjusting the pH of the pulp to between 2-6 by adding aminic acid, sulfuric acid, hydrochloric acid or another acid which does not contain oxidizing perhydroxyl ions. (b) Feeding the pulp to the acid tower. (c) Treating the pulp in the acid tower at substantially the pH, between 2-6 (preferably 3-4), to which it has been adjusted in step (a), at a pressure of 0-20 bar, at a temperature of 75-130°C (preferably 80-110°C), and for 20-240 minutes, so that acid treatment decreases the kappa number by 1-9 units (e.g. at least 2 units). (d) Transferring (page 5, lines 18-37) the pulp from the acid tower to the tower of the second treatment stage. (e) In the second treatment stage tower (see page 6, lines 13-22) treating the pulp with a complexing agent (optionally with chlorine dioxide) at a pH of between 4-9 (e.g. 5-6). (f) Washing,

pressing, or both washing and pressing the pulp (see page 6, line 24 through page 7, line 7). And (g) Bleaching the pulp with hydrogen peroxide (e.g. in an alkaline stage) using 5 to 20 kg peroxide/adt and 0 – 15 kg oxygen/adt (page 7, lines 9-21).

In the method, preferably (see page 7, line 23 through page 8, line 25) step (g) is further practiced by: mixing peroxide with the pulp; feeding the pulp into the pretreatment reactor and treating the pulp in the pretreatment reactor at a pressure of 3-20 bar and for a reaction time of 10-60 minutes, so that the peroxide reacts with the pulp; separating gas from the pulp; using the pressure in the pretreatment reactor, blowing the pulp to a lower section of the bleach tower so that the pulp flows upwardly in the bleach tower; and removing the pulp from the top of the bleach tower after the pulp reacts with the peroxide in the bleach tower. That is, steps (a)-(g) may be practiced as part of a treatment sequence of the pulp, in which the steps are practiced to bleach the pulp to an ISO brightness of over 80, comprising Cooking - O - AQ - P, Cooking - O - AD - P, Cooking O - ADQ - P, Cooking - O - Ap_a - P, or Cooking - O - AP_aQ - P.

The invention further relates to a method of pre-treating, prior to bleaching with peroxide, cellulose pulp, to improve bleachability of the pulp, using an acid tower (14, 112), and a tower (24) in a second treatment stage, comprising the steps of substantially sequentially: (a) If necessary, adjusting the pH of the pulp to between 2-6 by adding (see page 13, lines 11 and 12) aminic acid, sulfuric acid, hydrochloric acid or another acid which does not contain oxidizing perhydroxyl ions. (b) Feeding the pulp to the acid tower. (c) Treating the pulp in the acid tower at substantially the pH, between 2-6, to which it has been adjusted in step (a), at a pressure of 0-20 bar, at a

temperature of 75-130°C, and for 20-240 minutes, so that acid treatment decreases the kappa number by 1-9 units. (d) Transferring the pulp from the acid tower to the tower of the second treatment stage. (e) In the second treatment stage tower treating the pulp with chlorine dioxide and adding chemicals to the pulp to adjust the metal profile of the pulp prior to, or in combination with, the chlorine dioxide treatment. (f) Washing, pressing, or both washing and pressing the pulp. And (g) bleaching the pulp using hydrogen peroxide.

VI. ISSUES

Are Claims 16-19, 21-22, 24-30 and 34 properly rejected under 35 USC §103(a) as being unpatentable over WO 94/20674 in view of EP 0 622 491 with or without Marechal?

Is the "phantom" rejection of claims 36 through 46 appropriate?

Is claim 35 properly rejected under 35 USC §103(a) as being unpatentable over WO 94/20674 in view of EP 0 622 491 with or without Marechal as applied to claim 1 above, and further in view of JP 57-21591 and Walsh?

VII. GROUPING OF CLAIMS

All of the claims are independently patentably distinct from each other and from the prior art for the reasons set forth in detail in the Argument section below.

VIII. ARGUMENT

Claims 16-19, 21-22, 24-30 and 34 are not properly rejected under 35 USC §103(a) as being unpatentable over WO 94/20674 in view of EP 0 622 491 with or without Marechal

The invention relates to a method of pretreating cellulose pulp prior to bleaching with peroxide in order to improve the bleachability of the pulp. It has been found according to the present invention that if the pulp is treated in a treatment stage where the kappa number of the pulp is lowered under acidic and hot conditions, with the pH properly adjusted, and thereafter the pulp is chelated, the bleachability of the pulp is optimized with respect to both metals and the kappa number, prior to actual treatment in the peroxide stage. In a second treatment stage tower, after the acid tower, the pulp may be treated with chlorine dioxide which cost-effectively enhances the bleachability of the pulp.

That is according to the invention as recited in claim 16, if necessary cellulose pulp has the pH thereof adjusted to between 2-6 by adding an acid that does not contain oxidizing perhydroxyl ions, the pulp is fed to an acid tower, and the pulp is treated in the acid tower at substantially the same pH (between 2-6) to which it has been adjusted, at a pressure of 0-20 bar, at a temperature of 75-130°C, and for 20 to 240 minutes (e.g. a temperature 80-110°C, at a pH of between about 3-4, for a time of 30-180 minutes), so as to decrease the kappa number by one to nine units, typically at least two units. Then the pulp is transferred from the acid tower to a tower of a second treatment stage, in which chelation occurs, that is treatment with a complexing agent at a pH of between 4-9. Then the pulp is washed, pressed, or both, and then bleached

with hydroxide peroxide using 5-20 kg peroxide per air dried ton of pulp, and 0-15 kg oxygen per air dried ton of pulp.

It is respectfully submitted that neither the Devenyns nor the EP '491 references, with or without Marechal, teach the claimed invention even if the references are combined.

In the Final Rejection it is alleged that Devenyns teaches a bleaching sequence in which a Q stage is preceded by an A-washing stage. However the undersigned can find no place in Devenyns, or in the Devenyns translation earlier submitted, where there is any discussion of such a sequence. All that Devenyns suggests, as far as the undersigned can tell, is that metal removal is done either by chelating (a Q stage) or using an acid stage (see page 5). Devenyns also teaches that a substantial amount of acid may be added to the chelating stage. However this has nothing to do with the invention as recited in claim 16 where acid treatment is done for lowering the kappa number, and then in a subsequent stage chelation is practiced for metals removal.

Devenyns relates to a pulp bleaching method comprising series of chlorine-free stages. According to page 2, lines 8-26, the object of the invention is to remedy the drawbacks of known processes by providing a method which achieves efficient delignification of unbleached chemical pulp, which allows obtaining pulps having high intrinsic qualities without the need to use chlorine reactants.

To that end, the Devenyns invention relates to a chemical paper pulp delignification method using a sequence of chlorine-free stages according to which a reactant chosen from oxygen, metal ion sequestering agents, and hydrogen peroxide is applied, characterized in that the sequence comprises the following successive stages:

O-Q-P-A

wherein

O refers to a treatment stage with oxygen,

Q refers to a stage in which the pulp is decontaminated from its metal ions,

P refers to a treatment stage with alkaline hydrogen peroxide, and

A refers to a treatment stage with peroxycid.

The independent claim of the Devenyns patent, i.e. claim 1, corresponds to the above definition of the Devenyns invention.

Thus it appears clear that not only does Devenyns not teach steps (c) and (e) of claim 16, let alone in a sequence of steps (c), then (e), and then (g) as set forth in claim 16, but rather Devenyns provides a teaching specifically contrary to the invention.

The EP '491 reference does not remedy the deficiencies of Devenyns as far as teaching the claimed invention is concerned, and in fact also teaches away from the present invention. EP '491 relates to a method of bleaching pulp in which the pulp is first treated with acid, desirably together with complexing agents; see page 2, lines 49-50, page 3, lines 10-11 and 21-24, and page 4, lines 33-35.

The acid treatment of EP '491 is directed merely to the removal of metal ions as clearly stated on page 4, lines 47 to 50 where even an additional acid treatment stage has been suggested but merely for obtaining a particularly low content of transition metals. If a delignifying effect is desired, the acid treatment is suggested to be performed in the presence of a delignifying chemical (page 4, lines 51 to 56). In general, EP '491 gives the impression that delignification is equal to the reduction of kappa number, and vice versa. In other words, EP '491 does not recognize the

possibility of decreasing the kappa number of pulp with a mere acid stage, but rather requires that a delignifying chemical must be used if such an effect is desired.

In reviewing the process parameters given in EP '491 it is seen that the preferable ranges for temperature and residence time are 40 to 80°C and 10 min. to 60 min. What this means is that the authors of EP '491 felt that the preferable reaction parameters were the best for their purposes. And since their purpose is to remove transition metals they are undoubtedly correct. But there is a difference between the removal of transition metals and the decrease of kappa number in an acid stage. In the claimed invention (i.e. for decreasing the kappa number in an acid stage) one requires either significantly longer residence time or significantly higher temperature. For instance, the instant application specification gives an example where the residence time is 3 hours (180 minutes) and the temperature 100°C. In other words, both parameters are out of the preferred range of the ones given in EP '491. In other words, the teachings of EP '491 do not lead a single reader to perform experiments which would result in a decrease in kappa number. That is the EP '491 reference clearly does not teach treating the pulp in an acid tower so as to decrease the kappa number by 1-9 units, or at least two units, as recited in claims 16 and 17, respectively.

In other words, neither Devenyns nor EP '498 suggests the following treatments in two separate treatment towers: DQ, AQ and A_DQ. Neither one of these references teaches the advantages of using two different towers for the treatments. They do not realize that the process conditions can be chosen to match the requirements of the chemical in question when each chemical or group of chemicals have its/their own treatment tower. It is easy to see that the requirements of A and D are substantially the

same (at least pH) and that Q needs for instance a substantially higher pH than the other two chemicals. Also since the advantages are not taught there is no *prima facie* case. See *In re Gordon*, 221 USPQ 1125, 1127 (Fed. Cir. 1984):

"We are persuaded that the board erred in its conclusion of *prima facie* obviousness. ... The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification."

Thus, even if Devenyns and EP '491 are combined, there is absolutely no suggestion for the specific steps (c) and (e) of claim 16, let alone in the sequence recited and including step (g). However if the references in combination did teach all of the features of claim 16 (which they do not), there still clearly and unequivocally is no *prima facie* case of obviousness.

To have a *prima facie* case of obviousness, the references in and of themselves must teach the claimed invention. In this regard see *In re Rouffet*, 149 F.3d 1350, 47 USPQ2d 1453, 55-9 (Fed. Cir. 1998):

"To reject claims in an application under section 103, an examiner must show an unrebutted *prima facie* case of obviousness. See *In re Deuel*, 51 F.3d 1552, 1557, 34 USPQ2d 1210, 1214 (Fed. Cir. 1995). In the absence of a proper *prima facie* case of obviousness, an applicant who complies with the other statutory requirements is entitled to a patent. See *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). On appeal to the Board, an applicant can overcome a rejection by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness. See *id.*

When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references. See *In re Geiger*, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987). Although the suggestion to combine references may flow from the nature of the problem, see *Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1630 (Fed. Cir. 1996), the suggestion more often comes from the teachings of the pertinent references, see *In re Sernaker*, 702

F.2d 989, 994, 217 USPQ 1, 5 (Fed. Cir. 1983), or from the ordinary knowledge of those skilled in the art that certain references are of special importance in a particular field, see Pro-Mold, 75 F.3d at 1573 (citing Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 297 n.24, 227 USPQ 657, 667 n.24 (Fed. Cir. 1985)). Therefore, “[w]hen determining the patentability of a claimed invention which combines two known elements, ‘the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.’” See *In re Beattie*, 974 F.2d 1309, 1311-12, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992) (quoting Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984)). ...

As this court has stated, “virtually all [inventions] are combinations of old elements.” *Environmental Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 698, 218 USPQ 865, 870 (Fed. Cir. 1983); see also *Richdel, Inc. v. Sunspool Corp.*, 714 F.2d 1573, 1579-80, 219 USPQ 8, 12 (Fed. Cir. 1983) (“Most, if not all, inventions are combinations and mostly of old elements.”). Therefore an examiner may often find every element of a claimed invention in the prior art. If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be “an illogical and inappropriate process by which to determine patentability.” *Sensorics, Inc. v. Aerasonic Corp.*, 81 F.3d 1566, 1570, 38 USPQ2d 1551, 1554 (Fed. Cir. 1996).

To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the examiner to show a motivation to combine the references that create the case of obviousness. In other words, the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed.

This court has identified three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art. In this case, the Board relied upon none of these. ...

Because the Board did not explain the specific understanding or principle within the knowledge of a skilled artisan that would motivate one with no knowledge of Rouffet’s invention to make the combination, this court infers that the examiner selected these references with the assistance of hindsight. This court forbids the use of hindsight in the selection of references that comprise the

case of obviousness. See *In re Gorman*, 933 F.2d 982, 986, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991). Lacking a motivation to combine references, the Board did not show a proper *prima facie* case of obviousness. This court reverses the rejection over the combination of King, Rosen, and Ruddy."

Here there is nothing about the nature of the problem solved, the teachings of the prior art, or the knowledge of persons of ordinary skill in the art, that would suggest the combination of Devenyns with EP '491 made in the previous Action. Rather the claimed invention is in fact specifically contrary to those references since EP '491 teaches that a delignifying chemical must be used with acid in order to decrease the kappa number, and Devenyns teaches an entirely different sequence than that provided according to the invention. To modify either Devenyns or EP '491 to provide the invention, one would have to go specifically against the teachings of those references, for which there is no suggestion in the prior art -- rather the combination would have to be based solely on hindsight. This is inappropriate as made clear by *In re Rouffet, supra*. Also in this regard see *In re Mercier*, 185 USPQ 774, 778 (CCPA 1975) wherein the Court held:

"The relevant portions of a reference include not only those teachings which would suggest particular aspects of an invention to one having ordinary skill in the art, but also those teachings which would lead such a person away from the claimed invention. See *In re Lunsford*, 53 CCPA 986, 357 F.2d 380, 148 USPQ 716 (1966). ... Without the benefit of appellant's disclosure, a person having ordinary skill in the art would not know what portions of the disclosure of the reference to consider and what portions to disregard as irrelevant, or misleading. See *In re Wesslau*, 53 CCPA 746, 353 F.2d 238, 147 USPQ 391 (1965)." [Emphasis added]

The only thing Marechal teaches is that the kappa number decreases by an acid treatment at high temperature and low consistency (see Marechal, pages 269, the

beginning of the first full paragraph). Marechal clearly teaches that his process is suitable only for pulp consistencies below 5% whereby it is clear that such a process is not industrially applicable due to huge sizes of the treatment vessels, etc. The teachings of Marechal cannot logically be combined with the ones of Devenyns and the EP '491 reference as the two later mentioned references direct one of ordinary skill away from the temperature and consistency range of Marechal. There simply is no *prima facie* case whether or not Marechal is considered.

Thus independent claim 16 clearly patentably distinguishes from the art.

Reconsideration is also respectfully requested of the rejection of the claims dependent upon claim 16, namely 17 through 19, 21, 22, and 24 through 34. The Final Rejection nowhere mentions any of these claims or the specific features set forth in these claims. Nor does the undersigned see in the references the particular conditions for step (c) set forth in claim 17, let alone in combination with the particular conditions set forth in claim 18 for step (e), the use of chlorine dioxide in the practice of step (e) as set forth in claim 19, the particular additional step in claim 22, utilizing a fractionating washer etc. as set forth in claim 24, utilizing the two towers set forth in claim 25, utilizing the particular conditions for the peroxide treatment set forth in claim 26, the addition of the particular amount of chlorine dioxide in step (e) as recited in claim 33, or the particular sequence set forth in claim 34. Further there simply is no suggestion within any reference as to why anyone of ordinary skill would modify the references to teach these features, and therefore clearly no *prima facie* case of obviousness. The PTO has not discharged its duty to prove a *prima facie* case by facts with respect to any of these claims. Therefore all of the claims clearly patentably distinguish from the art.

The "phantom" rejection of claims 36 through 46 is inappropriate

The Examiner's Answer nowhere mentions claims 36 through 46 except on the cover sheet. Of course, it is in complete contravention of the Rules of Practice, the MPEP, and the principles of due process for appellants' claims to be rejected out of hand without even giving any reasons why. Therefore, for this reason alone the phantom rejection of claims 36 through 46 is completely inappropriate, not even an attempt being made to set forth the factual basis for such rejections. See *In re Warner*, 154 USPQ 173, 177-78 (CCPA 1967).

Claims 36 through 46 also clearly patentably distinguish from the art for the same reasons set forth above with respect to claim 16, and also because there clearly and unequivocally is no teaching in the references of step (e) of claim 36 in which chlorine dioxide is used to effect treatment. Nor are the features of any of the claims dependent upon claim 36 (the limitations of which are incorporated by reference) taught by the references even if combined. Further there simply is no suggestion within any reference as to why anyone of ordinary skill would modify the references to teach these features, and therefore clearly no *prima facie* case of obviousness. The PTO has not discharged its duty to prove a *prima facie* case by facts with respect to any of these claims. Therefore all of the claims clearly patentably distinguish from the art.

Claim 35 is not properly rejected under 35 USC §103(a) as being unpatentable over WO 94/20674 in view of EP 0 622 491 with or without Marechal as applied to claim 1 above, and further in view of JP 57-21591 and Walsh

Reconsideration is also respectfully requested of the rejection of claim 35 on page 3 of the Action adding the JP 57-21591 and Walsh references. Neither the JP nor Walsh references in any way remedies the deficiencies of the primary references as far as teaching the claimed invention is concerned therefore even if the references are combined the claimed invention does not ensue. Further, there simply is no *prima facie* case of obviousness; that is there is no motivation why one of ordinary skill in the art would combine the teachings of the references in order to provide the claimed invention. Nor do either the JP or Walsh references teach the particular sequence recited in claim 35. The mere fact that part of the sequence set forth in claim 35 might be shown in the Japanese reference or Walsh provides absolutely no reason why the complete sequence recited in claim 35 would be used, nor any reason why one of ordinary skill in the art would modify the primary references to provide the same, especially since it appears contrary to the primary references to do that.

IX. CONCLUSION

In conclusion it is believed that the application is in clear condition for allowance; therefore, early reversal of the Final Rejection and passage of the subject application to issue are earnestly solicited.

Respectfully submitted,

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APPENDIX

16. A method of pre-treating, prior to bleaching with peroxide, cellulose pulp, to improve bleachability of the pulp, using an acid tower, and a tower in a second treatment stage, comprising the steps of substantially sequentially:

- (a) if necessary, adjusting the pH of the pulp to between 2-6 by adding aminic acid, sulfuric acid, hydrochloric acid or another acid which does not contain oxidizing perhydroxyl ions;
- (b) feeding the pulp to the acid tower;
- (c) treating the pulp in the acid tower at substantially the pH, between 2-6, to which it has been adjusted in step (a), at a pressure of 0-20 bar, at a temperature of 75-130°C, and for 20-240 minutes, so that acid treatment decreases the kappa number by 1-9 units;
- (d) transferring the pulp from the acid tower to the tower of the second treatment stage,
- (e) in the second treatment stage tower treating the pulp with a complexing agent at a pH of between 4-9;
- (f) washing, pressing, or both washing and pressing the pulp; and
- (g) bleaching the pulp with hydrogen peroxide using 5 to 20 kg peroxide/adt and 0 - 15 kg oxygen/adt.

17. A method as recited in claim 16 wherein step (c) is practiced at a pH between about 3-4, at a temperature of 80-110°C; and so that acid treatment decreases the kappa number of the pulp by at least 2 units.

18. A method as recited in claim 17 wherein step (e) is practiced using a complexing agent, and at a pH of between about 5-6.
19. A method as recited in claim 17 wherein step (e) is practiced using as an oxidizing chemical chlorine dioxide prior to or in combination with the complexing agent.
21. A method as recited in claim 20 wherein step (g) is practiced by treating with hydrogen peroxide alone in a stage, or by adding hydrogen peroxide to an alkaline stage.
22. A method as recited in claim 18 wherein prior to step (e), between steps (c) and (e), adding acid to alkali to the pulp to adjust the pH thereof.
24. A method as recited in claim 16 wherein step (f) is practiced by washing the pulp in a fractionating washer so that a first filtrate containing heavy metals is removed from the process, and a second, cleaner, filtrate is recycled for use in another stage of the method.
25. A method as recited in claim 20 wherein step (g) is practiced using two towers which are different in size and connected to each other, the first tower acting as a pretreatment reactor and the second tower as a bleach tower.
26. A method as recited in claim 25 wherein step (g) is further practiced by: mixing peroxide with the pulp; feeding the pulp into the pretreatment reactor and treating the pulp in the pretreatment reactor at a pressure of 3-20 bar and for a reaction time of 10-60 minutes, so that the peroxide reacts with the pulp; separating gas from the pulp; using the pressure in the pretreatment reactor, blowing the pulp to a lower section of the bleach tower so that the pulp flows upwardly in the bleach tower; and

removing the pulp from the top of the bleach tower after the pulp reacts with the peroxide in the bleach tower.

27. A method as recited in claim 26 wherein the mixing step is practiced by adding 5-20 kg/adt peroxide, and 0-10 kg/adt oxygen to the pulp.

28. A method as recited in claim 26 wherein step (g) is further practiced by using a peroxide dosage that is from about 5 to just below 10 kg/adt, and using an oxygen dosage of between 5-15 kg/adt.

29. A method as recited in claim 26 wherein during treatment of the pulp in the bleach tower the pressure is between 1.1-5 bar, and the temperature 80-130°C.

30. A method as recited in claim 16 wherein step (g) is practiced in two stages using peroxide, the first stage in sequence using a peroxide dosage of between 5 to just below 10 kg/adt and with about 5-15 kg/adt oxygen, and the second peroxide stage in sequence having a dosage of 10-20 kg/adt peroxide and an oxygen dosage of 0-10 kg/adt.

32. A method as recited in claim 16 wherein step (g) is practiced by adding between 5-just below 10 kg/adt peroxide and 5-15 kg/adt oxygen.

33. A method as recited in claim 19 wherein step (e) is practiced by using 5-30 kg/adt chlorine dioxide calculated as active chlorine.

34. A method as recited in claim 16 wherein steps (a) through (g) are practiced as part of a treatment sequence of the pulp, in which the steps are practiced to bleach the pulp to an ISO brightness of over 80, comprising Cooking - O - AQ - P, Cooking - O - AD - P, Cooking O - ADQ - P, Cooking - O - Ap_a - P, or Cooking - O - AP_aQ - P.

35. A method as recited in claim 16 wherein steps (a) through (g) are practiced to produce pulp at an ISO brightness of over 88, and is a part of the treatment sequence of Cooking - O - AQ - P_aQ - P.

36. A method of pre-treating, prior to bleaching with peroxide, cellulose pulp, to improve bleachability of the pulp, using an acid tower, and a tower in a second treatment stage, comprising the steps of substantially sequentially:

- (a) if necessary, adjusting the pH of the pulp to between 2-6 by adding aminic acid, sulfuric acid, hydrochloric acid or another acid which does not contain oxidizing perhydroxyl ions;
- (b) feeding the pulp to the acid tower;
- (c) treating the pulp in the acid tower at substantially the pH, between 2-6, to which it has been adjusted in step (a), at a pressure of 0-20 bar, at a temperature of 75-130°C, and for 20-240 minutes, so that acid treatment decreases the kappa number by 1-9 units;
- (d) transferring the pulp from the acid tower to the tower of the second treatment stage,
- (e) in the second treatment stage tower treating the pulp with chlorine dioxide and adding chemicals to the pulp to adjust the metal profile of the pulp prior to, or in combination with, the chlorine dioxide treatment;
- (f) washing, pressing, or both washing and pressing the pulp; and
- (g) bleaching the pulp using hydrogen peroxide.

37. A method as recited in claim 36 wherein step (c) is practiced at a pH between about 3 - 4, at a temperature of 80-110°C, for a time of 30-180 minutes, and so that acid treatment decreases the kappa number of the pulp by at least 2 units.

38. A method as recited in claim 37 wherein step (e) is practiced using a complexing agent at a pH of between about 4 – 9.

39. A method as recited in claim 36 wherein step (g) is practiced by treating with hydrogen peroxide alone in a stage, or by adding hydrogen peroxide to an alkaline stage.

40. A method as recited in claim 38 wherein prior to step (e), between steps (c) and (e), adding acid or alkali to the pulp to adjust the pH thereof.

41. A method as recited in claim 36 wherein step (f) is practiced by washing the pulp in a fractionating washer so that a first filtrate containing heavy metals is removed from the process, and a second, cleaner, filtrate is recycled for use in another stage of the method.

42. A method as recited in claim 36 wherein step (g) is practiced using two towers which are different in size and connected to each other, the first tower acting as a pretreatment reactor and the second tower as a bleach tower.

43. A method as recited in claim 42 wherein step (g) is further practiced by: mixing peroxide with the pulp; feeding the pulp into the pretreatment reactor and treating the pulp in the pretreatment reactor at a pressure of 3-20 bar and for a reaction time of 10-60 minutes, so that the peroxide reacts with the pulp; separating gas from the pulp; using the pressure in the pretreatment reactor, blowing the pulp to a lower section of the bleach tower so that the pulp flows upwardly in the bleach tower; and

removing the pulp from the top of the bleach tower after the pulp reacts with the peroxide in the bleach tower.

44. A method as recited in claim 36 wherein step (g) is practiced in two stages using peroxide, the first stage in sequence using a peroxide dosage of between 5 to just below 10 kg/adt and with about 5-15 kg/adt oxygen, and the second peroxide stage in sequence having a dosage of 10-20 kg/adt peroxide and an oxygen dosage of 0-10 kg/adt.

45. A method as recited in claim 36 wherein step (e) is practiced by using 5-30 kg/adt chlorine dioxide calculated as active chlorine.

46. A method as recited in claim 36 wherein steps (a) through (g) are practiced as part of a treatment sequence of the pulp, in which the steps are practiced to bleach the pulp to an ISO brightness of over 80, comprising Cooking - 0- AD - P, or Cooking 0 - ADQ - P.